김 지 훈 석사학위논문

Do emergency physicians improve the appropriateness of emergency transfer in rural areas?

의료 취약 지역에 있는 응급 의료 기관의 첫 대면 의사의 전공과 응급 전원 적절성과의 관계

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ABSTRACT

Do emergency physicians improve the appropriateness of emergency transfer in rural areas?

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Background: Until recently, there have been few studies on the transfer of patients from emergency departments (EDs) overall, as such studies were limited primarily to trauma patients.

Objectives: The purpose of this study was to investigate the association between the specialty of the first-contact physician and the appropriateness of the emergency transfer (AET).

Methods: This was a retrospective, observational study performed at two level-3 EDs in a rural area. A transfer to a higher-level ED for the purpose of patient stabilization was defined as an emergency transfer, and transfers were classified as "appropriate" when the emergency status of the patient could not be resolved by the referring ED. The primary outcome was AET, which was reviewed by an expert panel for reliability. Statistically significant variables were selected as covariates based on the results of a univariate analysis, and a multivariate logistic regression analysis was performed to estimate the odds ratios (ORs) with 95% confidence intervals (CIs) on the AET.

Results: A total of 1325 patients underwent transfer to another hospital from the two EDs. Of these, 1003 were classified into the emergency transfer group. In both EDs, the incidence of appropriate emergency transfers was significantly higher when the first-contact physician was an emergency physician (OR, 4.005; 95% CI, 2.619 - 6.125 and OR, 4.006; 95% CI, 1.696 - 9.459 for each hospital,

respectively).

Conclusion: There was a positive association between the specialty of the first-contact physician and the AET among EDs located in rural areas making patient transfers.

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keywords : Emergency service, hospital; Patient transfer; Physician's role; Referral and consultation

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Introduction

In Korea, emergency departments (EDs) are formally designated as level 1, 2, or 3 by a government health authority. The designation is largely based on the ED's level of human resources, essential instruments and equipment, and service levels, such as the availability of certain specialists. Most level-3 EDs are not well equipped and are usually served by general physicians. However, by law, level 1 and level 2 EDs must be covered by emergency physicians 24 hours per day. In Korea, there are 20 regional EDs (level 1), 99 local EDs (level 2), approximately 300 small EDs (level 3), and approximately 400 non-ED facilities that treat small numbers of emergency patients (1). The level of ED in the rural area of Korea is mostly level 3, and it is difficult to treat critical ill patients.

The primary cause of difficulties in treating critically ill patients in rural areas is that there are very few specialists with sufficient training and there are limited medical resources available to stabilize emergency-status patients (2-4). Therefore, when patients visit lower-level emergency departments (EDs) that cannot stabilize their emergency status, they should be transferred to upper-level EDs that can.

However, in some cases, primary ED physicians in lower-level EDs may cause an inappropriate emergency transfer (5). Inappropriate transfers were due to two main causes. First, they occurred when the patient's status was overestimated by physicians, and second, they occurred when the physician was not capable of initial treatment. An example of the former is a case in which the physician assessed that a patient with a fracture did not need emergency surgery when the patient actually did need it. An example of the latter is a case in

which acute pneumothorax was confirmed but the physician did not have chest tube insertion ability and transferred the patient to a higher-level hospital. In appropriate transfers may overwhelm tertiary emergency center resources(6), and delay definitive care and can be costly or inconvenient for patients and their families(7).

Emergency physicians are trained to determine the severity of a patient's status in order to identify and manage emergencies for 4 years in Korea. Thus, it is predicted that the ability to diagnose and treat emergency situations will be superior to those of other clinicians. We presumed that inappropriate emergency transfers are caused by capacity of physicians, not ED facilities level. So we hypothesized that if emergency physicians were the first-contact physicians in lower-level emergency centers, it would reduce inappropriate emergency transfers. However, most studies on inappropriate emergency transfers have been limited primarily to trauma patients (6,8,9). In this study, we evaluated whether secondary triage was more accurate when the emergency physician served as the first-contact physician in level-3 EDs and whether the appropriateness of the emergency transfer (AET) was more accurate for emergency physicians than for other specialists.

Materials and Methods

Study design

This was a retrospective observational study of patients transferred to another hospital from two level-3 EDs in rural Korea. This study was approved by the institutional review boards of the study

institutions and was performed in accordance with the ethical standards laid down in an appropriate version of the Declaration of Helsinki.

Study setting

We presumed that inappropriate emergency transfers are caused by capacity of physicians, regardless of ED facilities level. So we tried to verify our hypothesis to two EDs with different facilities levels. This study was completed in two rural counties in Korea, Soon-chang and Moo-an. The population was 30,368 in Soon-chang (2014) and 81,696 in Moo-an (2014). The population density was 61/km^2in Soon-chang and 124/km^2 in Moo-an. In Korea, EDs are formally designated as level1, 2, or 3 by a government health authority. Level 1 and level 2 EDs must be covered by emergency physicians 24h per day by law. The two study hospitals were level-3 EDs, and the majority of the first-contact physicians were not emergency physicians. The ED located in Soon-chang(ED1) is visited by 10,000 people per year and operates 15beds. It has 30 hospital beds, excluding the intensive care unit(ICU).There are three level-1 EDs nearby to which patients can be transferred after the primary evaluation, and transfer takes about 30minutes by ambulance. Seven thousand people visit the ED located in Moo-an(ED2) annually, which operates nine available beds; the hospital has 300beds, including the ICU. There are two level-1 centers nearby to which patients can be transferred immediately after the primary evaluation; transfer takes about 30minutes by ambulance. In ED1, one physician, two nurses, and one radiologist work on each shift, and plain radiography and arterial blood gas analysis are available to confirm results immediately. Emergency laboratory tests and computed

tomography(CT), magnetic resonance imaging(MRI), emergency endoscopy, angiography and intervention, and dialysis are not available. In ED2, one physician, two nurses, and one radiologist work on each shift, and plain radiography, emergency laboratory testing, portable ultrasonography, and CT are available 24hours per day. MRI and emergency endoscopy, angiography and intervention, and dialysis are not available in the ED. The first-contact physicians in both EDs should be able to stabilize the patient's emergency status and determine the patient's disposition using the available facilities without specialist consultation. If they need to consult a specialist to stabilize an emergency, or if they need to use additional emergency facilities, they should transfer the patient to another hospital. In both EDs, four physicians rotate the same number of working days and cover 365days per year. During the study period, 21 physicians served as the physicians for both EDs combined. Five first-contact physicians were board-certified emergency physicians, and 16 were physicians who were not specialists in emergency medicine. The 16 non-emergency physicians were six internal medicine physicians, two general surgeons, two neurologists, one rehabilitation physician, one neurosurgeon, one orthopedic surgeon, one otolaryngologist, one ophthalmologist, and one anesthesiologist.

Study population

From April 2013 to November 2014, we studid only patients transferred to another hospital from these two EDs who were eligible for emergency transfer based on the study definitions. The process of patients visiting an ED can be divided into input, throughput, and output stages(10), and the patient's disposition is determined as shown in Figure 1.

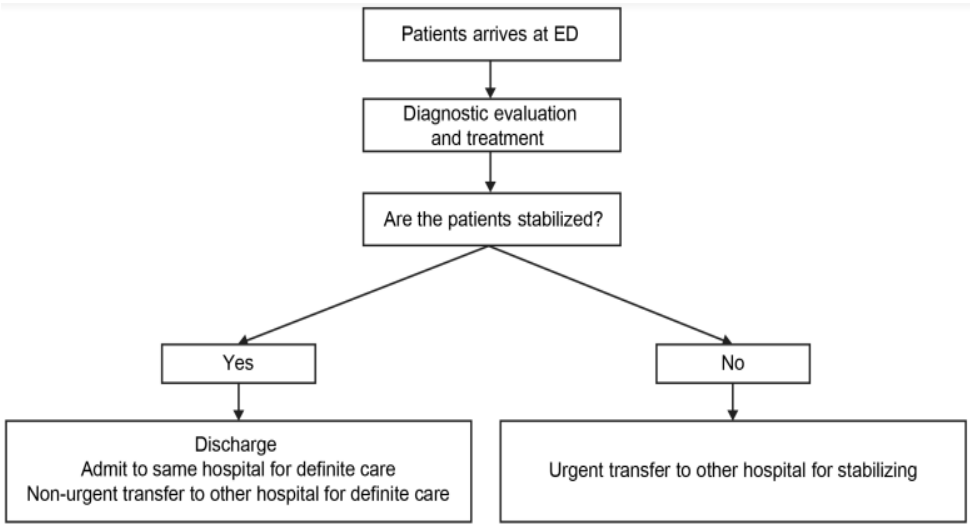

Figure 1. A conceptualized output flow diagram for emergency departments. Abbreviation: ED, emergency department.

Generally, there are two types of transfers from EDs to another hospital. First, patients could be transferred to a higher-level ED for stabilization when the diagnostic evaluation and emergency treatment (throughput stage) could not be performed by the referring hospital. Second, transfers could occur when the patient wished to be admitted to another hospital after completing evaluation and emergency treatment, when admission units of the referring hospital were not available, or when they were transferred for use of inpatient resources in the receiving hospital (output stage). In our study, only the former case was defined as an "emergency transfer" in the transfer registry. If researchers were not able to construct a transfer synopsis based on information contained in the patient's electronic medical records, we excluded that patient.

Data collection and processing

We retrospectively collected clinical data from both hospitals using transfer registry databases. From these, we acquired data, including patient age, sex, transfer day and time, insurance status, first triage result based on the patient's emergency severity index (ESI), clinical units and resources needed for treatment after transfer, the period for which the first-contact physician had worked as a physician, and the specialty of the first-contact physician. In our study, the first-contact physician responsible for transfer was defined as the person who contacted the receiving hospital and wrote the referral request. We also investigated the AET by using these databases. We analyzed a synopsis of each transfer to determine whether it was appropriate by using guidelines and medical literature. The synopsis was created to include the descriptions of the examinations and procedures performed in the referring ED, the final diagnosis, and the rationale by which the physician decided to make the transfer. If analysis of the synopsis suggested that the transferring ED could have stabilized the patient's status, the case was defined as an inappropriate emergency transfer. When the researchers determined that the emergency could not have been resolved by the referring ED facility, the case was defined as appropriate. Synopses were sent to an

independent expert review panel consisting of three board-certified emergency physicians. They reviewed the synopses and judged the AET according to our study definition. The panel was blinded to the purpose of the study. Each member evaluated the synopsis without knowing the judgment of other members or of the researcher.

Outcome measures

The primary outcome was the AET. We compared the percentage of appropriate transfers made by emergency physicians and by non-emergency physicians. We classified the reason for inappropriate emergency transfers into the overestimation of the physician and the lack of physician treatment ability. We also tried to identify the characteristics of inappropriate emergency transfers by analyzing the reasons why physicians decided to transfer and whether they were trauma patients in subgroups.

Statistical analysis

The kappa statistic proposed by Fleiss (11) was used to evaluate the agreement on multi-category measurements by multiple raters due to the subjectivity of the outcome variable, AET. The kappa statistic was interpreted using the following criteria: values of 0.00 - 0.20, 0.21 - 0.40, 0.41 - 0.60, 0.61 - 0.80, and 0.81 - 1.00 indicated slight, fair, moderate, good, and excellent agreement, respectively. A univariate logistic regression analysis was used to identify the association between the outcome and the covariates. Variables with p values $<$ 0.05 were included in multivariable logistic models to adjust for confounder effects. All reported p values were two-sided, and $p <$ 0.05 was considered to indicate statistical significance. All analyses were performed with SAS software, version 9.4 (SAS Institute, Cary, NC).

Results

During the study period, 1325 transfers occurred in the two EDs (ED1, 824 and ED2, 501). We excluded 44 patients because we could

not complete a transfer synopsis from the electronic medical record. Among the 1325 transfers, 1003 cases were classified as emergency transfers and were included in our analysis (Figure 2).

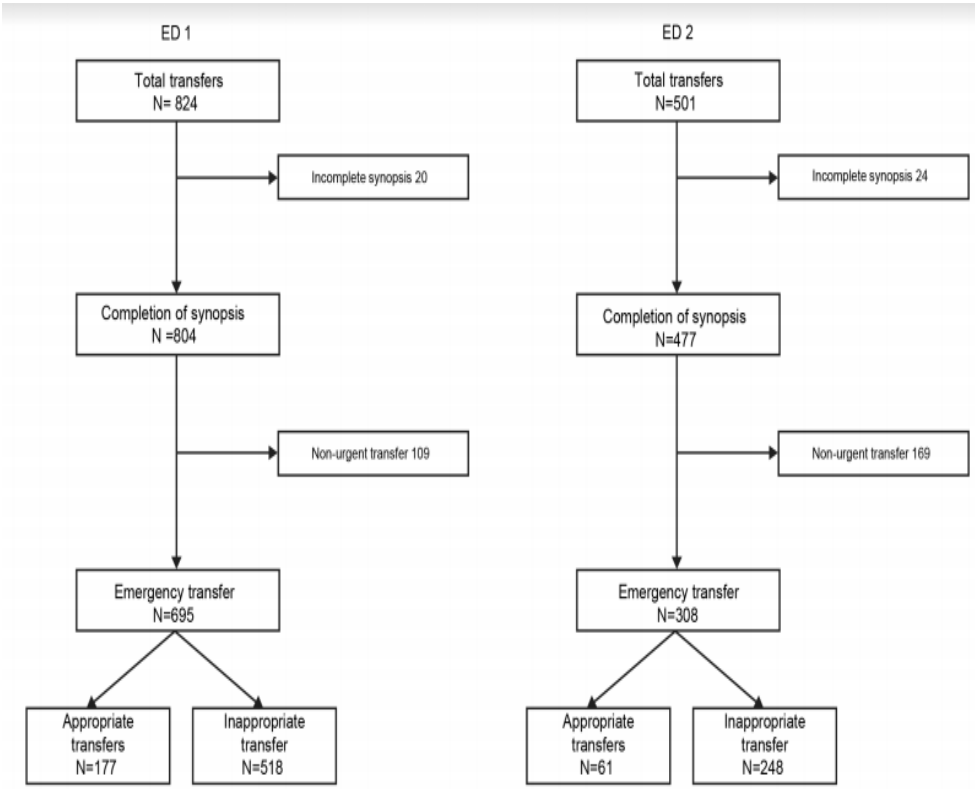

Figure 2. Study population: patient transfer registry from two emergency departments.

The results for all transfers classified by researchers and the classification results of the expert panel are shown in Table 1.

Table 1. Contingency table on the transfer category rated by each rater

Transfer category	Our result		Reviewer A		Reviewer B		Reviewer C	
	N	%	N	%	N	%	N	%
Appropriate	238	18.6	224	17.5	227	17.7	218	17.0
Inappropriate	765	59.7	785	61.3	776	60.6	800	62.5
Non-urgent	278	21.7	272	21.2	278	21.7	263	20.5

The agreement among multiple raters was excellent (kappa coefficient [SE]: 0.934 [0.008]). Figure 3 shows the distribution of the specialties of physicians in the two EDs by the day of the week.

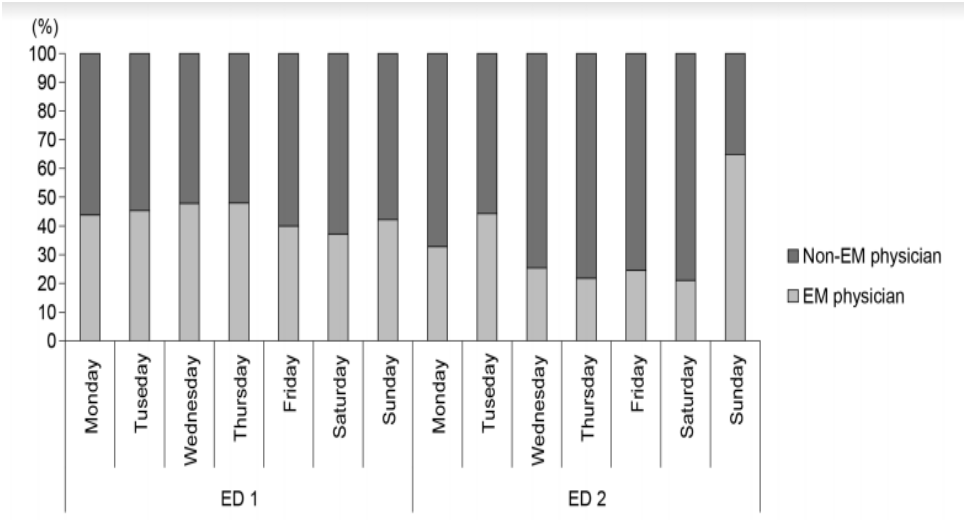

Figure 3. Distribution of emergency physicians as the fist-contact physicians in two emergency departments by the day of the week. Abbreviation: EM, emergency medicine

In ED1, the distribution of the day of the week between emergency physicians and non-emergency physicians was not significantly different. However, in ED2, from Monday to Saturday, a high percentage of non-emergency physicians acted as the first-contact physicians, and on Sunday, emergency physicians were more likely to be the first-contact physicians.

The factors that significantly increased appropriate emergency transfers in the univariate analysis were age, day of the week, and the ESI for both ED1 and ED2 (Table 2).

Table 2. Unadjusted odds ratios for the appropriateness of emergency transfer

	ED1		ED2	
	OR (95% CI)	P-value	OR (95% CI)	P-value
Age*	0.992 (0.986-0.999)	0.0248	0.976 (0.963-0.989)	0.0005
Sex				
Male	1 (Ref)		1 (Ref)	
Female	1.111 (0.787-1.569)	0.5484	1.037 (0.575-1.872)	0.9028
Insurance				
Medicaid type 1	1 (Ref)		1 (Ref)	
Medicaid type 2	0.943 (0.095-9.373)	0.9600	<0.001 (<0.001->999.999)	0.9841
National health insurance	1.700 (0.737-3.919)	0.2134	1.269 (0.356-4.524)	0.7133
None	0.314 (0.035-2.787)	0.2986	-	-
Motor vehicle insurance	1.768 (0.577-5.413)	0.3183	2.656 (0.674-10.475)	0.1629
Day of week*				
Weekday	1 (Ref)		1 (Ref)	
Weekend	1.635 (1.156-2.312)	0.0054	0.469 (0.245-0.897)	0.0221
Time factor				
Working hour on	1 (Ref)		1 (Ref)	
Working hour off	0.791 (0.503-1.244)	0.3107	1.541 (0.713-3.331)	0.2718
ESI*				
1, 2	1 (Ref)		1(Ref)	

3, 4	12.508 (5.426-28.837)	<.0001	4.213 (2.307-7.693)	<.0001
Clinical unit				
General internal medicine	1 (Ref)		1 (Ref)	
Orthopedics	9.423 (5.347-16.607)	<.0001	1.799 (0.750-4.313)	0.1882
Neurosurgery	0.781 (0.356-1.712)	0.5375	1.114 (0.475-2.612)	0.8047
Neurology	0.363 (0.131-1.005)	0.0512	2.192 (0.724-6.635)	0.1648
General surgery	0.694 (0.301-1.600)	.3920	1.827 (0.727-4.594)	0.2002
Plastic surgery	56.250 (12.117-261.136)	<.0001	5.846 (0.755-45.246)	0.0908
Ophthalmology	0.694 (0.150-3.224)	0.6416	<0.001 (<0.001->999.999)	0.9908
Otorhinolaryngology	2.273 (0.659-7.837)	0.1936	<0.001 (<0.001->999.999)	0.9908
Oral surgery	4.167 (0.655-26.510)	0.1306	<0.001 (<0.001->999.999)	0.9888
Pediatrics	1.736 (0.579-5.203)	0.3245	5.846 (0.755-45.246)	0.0908
Psychiatry	<0.001 (<0.001->999.999)	0.9954	-	-
Urology	1.562 (0.405-6.029)	0.5171	5.846 (0.344-99.417)	0.2219
Obstetrics	<0.001 (<0.001->999.999)	0.9935	<0.001 (<0.001->999.999)	0.9935
Thoracic surgery	<0.001 (<0.001->999.999)	0.9887	2.192 (0.514-9.360)	0.2892
Physicians' length of practice				
5 – 10 years	-	-	1 (Ref)	
10 – 15 years	-	-	1.284 (0.472-3.494)	0.6243
15 – 20 years	-	-	1.135 (0.621-2.075)	0.6811
More than 20 years	-	-	0.203 (0.026-1.576)	0.1273

*Identified as covariates in the univariate analysis. Abbreviations: ED, emergency department; OR, odds ratio; CI, confidence interval; ESI, emergency severity index

We set these factors as covariates and confirmed the associations between the first-contact physician's specialty and appropriate emergency transfer with a multivariable regression analysis (Table 3).

Table 3. Adjusted odds ratios for the appropriateness of emergency transfer

	ED1		ED2	
	OR (95% CI)	P-value	OR (95% CI)	P-value
Age	1.000 (0.993-1.008)	0.9397	1.016 (1.001-1.032)	0.0415
Day of week				
Weekday	1 (Ref)		1 (Ref)	
Weekend	0.703 (0.483-1.025)	0.0671	2.718 (1.317-5.607)	0.0068
ESI				
1, 2	1 (Ref)		1 (Ref)	
3, 4	0.085 (0.036-0.199)	<.0001	0.275 (0.141-0.536)	0.0002
Physician specialty				
Non-emergency	1 (Ref)		1 (Ref)	
Emergency	4.005 (2.619-6.125)	<.0001	4.006 (1.696-9.459)	0.0015

Abbreviations: ED, emergency department; OR, odds ratio; CI, confidence interval; ESI, emergency severity index.

In ED1, the emergency physician group had an odds ratio (OR) for appropriate emergency transfers of 4.005 (95% confidence interval [CI], 2.619 – 6.125), and in ED2, the emergency physician group had an OR for appropriate emergency transfers of 4.006 (95% CI, 1.696 – 9.459). Because the ratio of first-contact physicians to emergency physicians in ED2 was significantly different depending on the day of the week, a multivariable regression analysis, after matching the days of the week, was performed as a part of a sensitivity analysis. The results confirmed that when an emergency physician was the first-contact physician, the AET was significantly higher (4.154, 95% CI, 1.544 – 11.178); the direction of the results did not change after matching.

We conducted a subgroup analysis of inappropriate emergency transfer cases in both EDs (Table 4). Compared to that for emergency physicians, non-emergency physicians had a higher proportion of inappropriate transfers caused by overestimating the

patient's emergency status and often misdiagnosed the indication for urgent imaging study.

Table 4. Subgroup analysis of emergency transfers transfer

	Emergency physician (n=40)	Non-emergency physician (n=198)
Reason for inappropriate transfer, n (%)		
Overestimation	17 (42.5)	115 (58.1)
Treatment ability	23 (57.5)	83 (41.9)
Reason for transfer, n (%)		
Urgent imaging study	5 (12.5)	45 (22.7)
Urgent laboratory testing	3 (7.5)	9 (4.5)
Emergency operation	5 (12,5)	25 (12.6)
Specialist support	27 (67,5)	117 (59.1)
Emergency angiography	0 (0)	1 (0.5)
Emergency endoscopy	0 (0)	1 (0.5)
Urgent hemodialysis	0 (0)	0 (0)
Trauma *vs.* non-trauma, n (%)		
Medical (non-trauma)	8 (20)	43 (21.7)
Trauma	32 (80)	155 (78.3)

Discussion

We found that the AET improved when an emergency physician was the first-contact physician in the ED. The factors identified in our study that were associated with inappropriate emergency transfer were patient age, day of the week, and patient severity; these correspond to the results of previous studies. We controlled for these factors in another analysis and sought to determine the causality between the specialty of the first-contact physician and the AET.

Previously, many researchers investigated secondary over-triage, but most of those studies involved only trauma patients (5,6,9,12-14). Gatto et al. conducted a study on inappropriate transfer with pediatric patients, and they found that when pediatricians made transfer decisions, inappropriate transfers were reduced (8). To the best of our knowledge, our study was the first to identify the association between the first-contact physician's specialty and the AET for all transferred ED patients.

Secondary over-triage, or unnecessary patient transfer, is poorly characterized and lacks well-defined targets (12,15,16). Hence, every study has used different definitions. Our definition of secondary over-triage was quite different from that used in previous studies, in that our study judged over-triage at the transferring hospital. Sorensen et al. stated that it would be difficult to know the exact reason for emergency transfer used by the referring hospital when evaluating secondary triage at the referred hospital. They also noted that it was unreasonable to evaluate transfer decisions based on the final diagnosis at the referred hospital because they did not know how many work-ups occurred at the referring hospital (13). In addition, since the referred hospital could not know the change in the patient's condition that may have occurred during transfer, data from the referred hospital are limited in their ability to confirm the AET. Our study created a synopsis of the transfer decision process used at the referring ED, and researchers determined the decision's appropriateness using a structured guideline. Additionally, we conducted an expert panel review to confirm that the AET we determined was statistically reliable.

We classified all ED transfers into two categories based on whether

the situation remained urgent, and we included patients who were transferred without having first been stabilized (i.e., the throughput phase) in our study. Patients transferred to another hospital's ED after ending the throughput phase often attempt to be admitted to a ward or the ICU of the referred hospital through the ED if direct transfer to the admission unit is not possible. Since such cases are not categorized as a transfer made for emergency treatment or evaluation, it is reasonable to exclude them from our study, which set the AET as the outcome. In both EDs evaluated in our study, non-urgent transfers accounted for 109 (13.6%, ED1) and 169 (35.4%, ED2) of the cases, respectively. These patients wanted to move to another hospital of their choice for definite care or because the admission unit of the referring hospital was not available; such cases could not be considered a transfer due to a lack of ED capacity.

Although our study was retrospective, it was optimal for identifying the association between a specific characteristic of the first-contact physician and secondary over-triage. Both EDs had the same duty rotation system, in which first-contact physicians were assigned work equally in rotation. For the ED2 dataset, the first-contact physician's specialty was not evenly distributed throughout the week, but the results of the sensitivity analysis, which consisted of 106 people per group matching the day of week, did not change direction. First-contact physicians in both EDs made all decisions without relying on other specialists. This was appropriate for supporting the hypothesis that the individual factor of the first-contact physician was a causal factor for the outcome variable.

The quality of an emergency transfer depends on the ability of the medical staff in charge (3,17). The occurrence of secondary

over-triage is due to a physician in the referring hospital not being confident of the ED's ability to manage urgent patients (8). In rural areas where the ED cannot be fully equipped, human resources are more important than anything else (18,19). First-contact physicians in EDs have low rates of specializing in emergency medicine, especially in rural areas (20). Emergency physicians are trained intensively to recognize, treat, and make decisions in emergencies. Thus, they can more easily conduct secondary triage using an objective guideline than can other physicians in EDs and determine emergency transfers based on medically reasonable indications. Understanding the emergency medical system and cultivating the ability to manage the ED operation is defined as the training goal of emergency medicine specialists in Korea. Thus emergency medical specialists have experience managing various type of transfers in and out during training period, which results in competency for appropriate transfer. In addition, medical training in Korea is especially focused on training specialists rather than general physicians. Thus, the ability of non-emergency physicians to serve as first contact physicians is likely to be lower than that in other countries. In our analysis, emergency physicians were 4-fold more likely to make appropriate emergency transfers than were non-emergency physicians. Therefore, there is a need for an emergency physician at level-3 EDs, which are dependent on a small number of physicians and cannot hire many specialists due to costs.

Information in table 4 suggests that, compared to EM physicians, non-EM physicians inappropriately transferred patients due to a lack of ability to diagnose the emergency and that they often misdiagnosed the indications for urgent imaging study. One of the most important aspects of emergency medicine training is the ability

to determine patient disposition. Training to evaluate disposition helps physicians improve their ability to diagnose emergency status. It is not possible to place board certified emergency physicians in all level 3 EDs in Korea. Therefore, education for low-level ED physicians should be strengthened, focusing on the lack of non-EM physicians identified through this study.

This study has several limitations. First, because our study was retrospective, there may have been a confounder that we did not consider. In particular, the number of physicians participating in our study was small, so the individual ability of some physicians could have a major impact on the study results. Second, it is also possible that the outcome of our study has been overestimated , since members of the panel that judged the AET were biased toward an emergency medicine perspective. But they assessed the appropriateness based on guidelines and textbooks that is objective references with consensus on the whole medical field, so it did not seem to have a significant impact on our results. Third, since our study was conducted only in EDs located in two Korean rural areas, further research is needed to apply it to other rural areas. Finally, the researcher who judged the AET based on the medical record synopsis was not blinded to the study's purpose.

Conclusions

In two level-3 EDs in a rural area, we found a positive association between the first contact physician's specialty and the AET. For accurate secondary triage in lower-level EDs, the training of

first-contact physicians should be improved; in particular, emergency medicine training is required.

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ABSTRACT (IN KOREAN)

의료 취약 지역에 있는 응급 의료 기관의 첫 대면 의사 전공과 응급 전원 적절성과의 관계

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서론: 지금까지 응급 전원에 관한 주제로 전반적인 응급실 환자를 대상으로 진행한 연구는 드물다. 이에 대한 주제로 진행된 연구는 주로 외상 환자에 국한되어 진행되었다.

연구 목적: 이 연구는 응급실에서 첫 대면 의사의 전공과 그들이 진행하는 응급 전원의 적절성 사이의 연관성을 확인하고자 한다.

연구 방법: 본 연구는 후향적 관찰 연구로 의료 취약지역에 위치한 2곳의 응급 의료 기관에서 이루어졌다. 환자의 응급 상태를 안정화시키기 위한 상급 병원으로의 전원을 '응급 전원'으로 정의하였고, 전원하는 병원의 능력으로 환자의 응급 상태를 해결하지 못해서 전원한 경우를 '적절한 응급 전원'으로 정의하였다. 주요 결과 변수인 '응급 전원의 적절성'은 전문가로 구성된 위원회에 의해 신뢰도를 평가받았다. 결과 변수에 대해 단변량 분석을 진행하여 유의미하게 나온 변수들을 공변량으로 선택하여 다변량 로지스틱 회귀 분석을 진행하여 독립 변수의 상대 위험도를 95% 신뢰 구간에 대해 나타내었다.

결과: 연구 기간 동안 두 곳의 응급 의료 기관에서 총 1325명의 환자가 다른 병원으로 전원되었다. 이들 중 1003명의 환자가 응급 전원으로 분류되었다. 적절한 응급 전원이 이루어지는 비율은 전원하는 병원의 첫 대면 의사가 응급의학과 전문의일 경우 통계적으로 유의미하게 높았다 (OR, 4.005; 95% CI, 2.619 - 6.125 and OR, 4.006; 95% CI, 1.696 - 9.459).

결론: 의료 취약 지역에 위치한 응급실에서 이루어지는 응급 전원의 적절성 첫 대면 의사의 전공과 유의미한 연관성을 가진다.

주요어 : 응급의료와 병원; 환자 전원; 전원 문의; 첫 대면 의사 전공
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